

## ABSTRACT OF THE DISCLOSURE

A photoelectrochemical cell which includes a light transmissive enclosure, a semiconductor photoanode disposed within the light transmissive enclosure, a semiconductor photocathode disposed within the light transmissive enclosure, and an electrolytic solution disposed entirely between the semiconductor photoanode and the semiconductor photocathode. This is achieved by the use of semiconductor photoelectrodes (photoanodes and photocathodes) which include a proton exchange membrane having an electrolyte facing surface in contact with the electrolytic solution and a light transmissive wall facing surface, and having a photo  
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10 electro-catalyst disposed on the light transmissive wall facing surface.